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ABSTRACT

This paper compares and discusses the results from two user studies of interactive television (ITV) with a total of 50 subjects. The interfaces of two different ITV information services were studied: one with a place-like interface rich in graphics, animation and audio, and the other a simple interface with text and still images. In the first study; which evaluated the place-like interface, problems occurred with the mappings of the DTV-remote buttons and with the basic multimedia-interaction techniques used in interface. In the second study it was found that factors of concrete and conceptual nearness, with respect to the TV show, should be taken into account when evaluating the ITV service. (Author)

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A Media Rich Interface vs. a Simple Interface for Interactive Television

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Abstract We compare and discuss the results from two user studies of interactive television (ITV) with a total of 50 subjects. The interfaces of two different ITV information services were studied: one with a place-like interface rich in graphics, animation and audio, and the other a simple interface with text and still images. In the first study, which evaluated the place-like interface, problems occurred with the mappings of the DTV-remote buttons and with the basic multimedia-interaction techniques used in interface. In the second study it was found that factors of concrete and conceptual nearness, with respect to the TV show, should be taken into account when evaluating the ITV service.

ED 479 546

Introduction

ITV (Furth et al 1995, Ju et al 1994, Koller et al 1997, Srivastava 2002) allows for the development of graphically rich services with novel interfaces. ITV services surpass the limits of traditional text-TV based services in that they can resemble PC based multimedia applications. The resemblance is not perfect however, for ITV services multimedia is generally of lesser quality than traditional PC-based multimedia. The television screen, with low resolution and slow refresh rates, is not ideally suited for complex interfaces and the hardware performance of an ITV set-top box is drastically inferior to that of a standard PC. The current state of the art of ITV put developers in a dilemma. While they may recognize the possible gain of designing new and novel interfaces for ITV services, they also see the practical problems involved in such endeavors. On the one hand, if they develop simple interfaces modeled largely on traditional web sites (with e.g., navigation frame on left, content frame on right) they can be fairly confident that the design will at least work in practice. On the other hand, web-style interfaces may not be the best or even especially suitable for ITV services.

In what follows, we examine the results from two case studies of interfaces for interactive television. We discuss results on navigation, organization and level of engagement. The first case study was undertaken to help Teracom, a Swedish broadcasting network operator, evaluate a prototype ITV service with a place-like interface for educational TV. The second case study was conducted to guide The Swedish Educational Broadcasting Company (UR), a public service broadcasting institution, in designing simple user interfaces with text and still images for ITV information services in distance-learning.

Definitions

ITV can be implemented and deployed in various ways. In this paper interactive television (ITV) is seen as consisting of three parts:

(1) the ITV equipment which includes a remote control and a set-top box
(2) a digital TV show
(3) an interactive information service, complementing the digital TV show

The TV show is digital, but not interactive per se. Any interactivity is added by an ITV service, i.e., an interactive information service for digital television (se figure 1 for a screen shot of a service that was examined in one of the studies in this paper).

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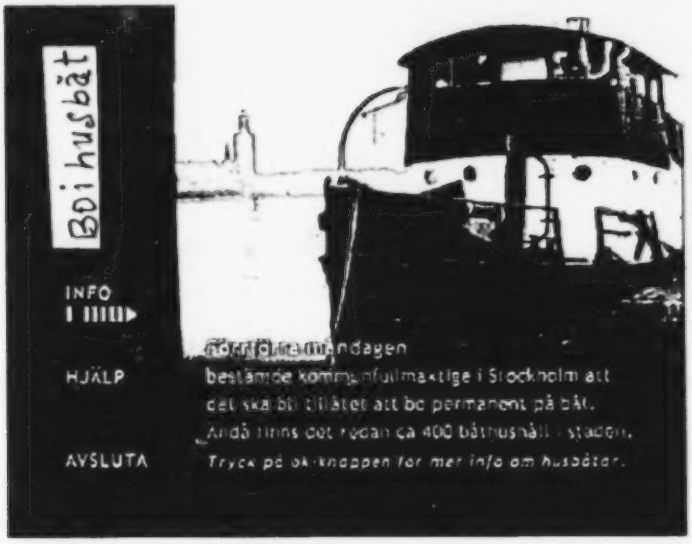
Bo i husbåt
INFO
HJÄLP
AVSLUTA
bestämde kommunfullmäktige i Stockholm att
det ska bli tillåtet att bo permanent på båt.
Tryck på ok-knappen för mer info om husbåtar.

Figure 1: A sample screen from an ITV information service for a TV show about houseboating

First Case Study Set-up

Equipment

A prototype ITV application developed with Macromedia Director™, running on a standard PC, and displayed on a TV through a Nokia™ set-top box was used in the study. The trials took place in a furnished living room (with e.g., a couch, framed paintings, and green plants). User explorations and conversations were video taped. The camera captured users and what they saw on the TV (trough a split signal cable to a second TV). The place-like environment was a simulation with a series of photographs. The ITV package permitted users to "drive" down a road using a remote control and reach interactive stations (movie clips, texts, and still images). The TV show was an educational TV show about the history of Sweden.

Subjects

20 subjects, age range 25-60, 12 female, and 8 male took part in the study.

Procedure

Each person participated with a friend, i.e., they formed a pair with someone they knew and felt comfortable with. Each pair was asked to imagine themselves as being part of a study group on digital media. The scenario was that a group met weekly to discuss digital media applications. Next week they were to discuss the application presented to them in the trial. The subjects were given minimal operating instructions and asked to explore the service so that they could report on it at the study group meeting. The experimenters then left the room to allow the subjects to explore the simulated ITV service on their own and discuss their experiences more freely. All trials were video taped and at the end of each trial, the subjects completed a questionnaire. Lastly, the subjects were interviewed. Trials lasted for about 45 minutes (including a 15 minute interview). The scenario was purposefully open-ended because one important aim was to approximate the natural viewing situation of someone getting started with the ITV service at home. Moreover, this open-ended scenario also allowed for testing the whole of the ITV service. Since no previous studies had been performed on the service it was important to conduct an explorative study. The scenario did, however, provide the subjects with a sufficiently concrete task so that they did not feel lost.

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Second Case Study Set-up

Equipment

A Sagem™ development set-top box with a remote control was used. It is similar to an ordinary Sagem™ set-top box, but has added functionality. The development set-top box and an ITV SDK (Software Development Kit) allow developers, to develop ITV services, and test them together with simulated TV shows. A video mixer was used to capture the TV screen (the simulated TV show and use of the ITV service). Thus both user reactions and what they saw on the TV in front of them was captured side-by-side on a single tape. The TV show was an educational TV show about house boats, and the ITV service complemented the TV show by providing images and texts about house boats.

Subjects

30 subjects participated in the final study: 20 were male, and 10 were female. The age range was 20-50 years.

Procedure

The procedure was the same as in the first study.

Results from the Case Studies

It is challenging to try to give an accurate comparison of two interfaces used in different applications, and tested in different studies. Not least, because the user groups might be incomparable. We have focused on three dimensions that we find concrete and possible to compare, although the last dimension (level of engagement) might, admittedly be highly influenced by the first two (ease of navigation and perceived organization). The questionnaires from the two studies revealed that the two ITV services from study one and study two received markedly different ratings on ease of navigation, organization, and on how engaging they were.

	Disagree completely	Disagree partly	Agree partly	Agree completely
Study 1: Place-like, media-rich interface				
Easy to navigate	30%	10%	30%	30%
Clear organization	50%	20%	25%	5%
Engaging	45%	35%	10%	10%
Study 2: Simple interface, text and still images				
Easy to navigate	7%	17%	3%	73%
Clear organization	17%	13%	13%	57%
Engaging	70%	10%	20%	0%

Table 1: Questionnaire responses for the two ITV-services from study one and study two with respect to navigation, organization and level of engagement.

On the one hand, the ITV service with the place-like interface was perceived as engaging but somewhat cumbersome to navigate and understand. On the other hand, the ITV service with the simple interface was easy to navigate and understand, while not being particularly engaging. This is just what might be expected, the novel, graphically rich interface is engaging but non-standard and consequently cumbersome to use. The simple interface, in contrast, is standard, but rudimentary and not very exciting. However, our analysis in the discussion section also gives another story.

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Discussion

Navigation and organization issues of the service with the place-like interface

The video tapes from the study with the service with the place-like interface were transcribed and coded. It turned out that majority of the sentences involved problems in using the interface. That the service was still perceived as engaging could be seen as indicating a potentially high value in using non-standard media-rich interfaces for ITV services. However, the content, among other factors, could have influenced the ratings on perceived level of engagement.

Closer examination of video sequences of breakdowns indicated a major problem with the ITV service with the place-like interface. Many subjects were frequently "stuck" and found themselves staring at the remote control. While users could go forward and back with the top and bottom buttons, it was impossible to go left and right with the left and right buttons. These latter buttons were used for content selection. Thus the buttons were mapped according to a cognitively dissonant schema. Cognitive dissonance (Festinger 1957) occurs when one must choose between incompatible beliefs or actions. Great dissonance is created when alternatives are equally viable as in the case of the ITV-navigation, i.e., seeing the ITV-navigation as spatially mapped to movement or seeing it as functionally mapped to content selection. Also, some subjects were oblivious to basic multimedia interaction techniques used in the interface, e.g., "highlighting" to show selection.

The lesson to be learned is not only that the mappings of remote controls should be logical, but that it is complex to develop non-standard interfaces. The risk of making mistakes is much higher than when developing more time-proven, standardized interfaces such as standard desktop applications with menu bars, tool bars and dialog boxes or even web site navigation. Not only is the risk of making mistakes higher because the interface is non-standard, but also because as indicated above, the user group for ITV is not necessarily on par with the average PC user with respect to understanding novel interfaces. It is easy to forget that ITV is an area of design with its own user demography.

Engagement issues and the content of the service with the simple interface

At first hand one might guess that the problems of engagement with the simple interface had to do only with the rudimentary nature of its interface. It was discovered however, that the content of the ITV service did not work so well. The content of the ITV service had been chosen so as to provide more information than was available in the TV show, e.g., it expanded on the presented subject matter. Most of the subjects were dissatisfied with the choice of content in the ITV service. The subjects did not report that the content was of low quality per se, but that it was unfitting. The content did not work well although it was conceptually close to the TV show. This might seem paradoxical. There is, however, a simple explanation for why the subjects reacted the way they did to the ITV service content. During interviews it became clear that the subjects wanted a particular kind of "content nearness". This nearness can be summarized (for want of a better expression) as TV show concrete nearness. Such nearness can be distinguished from TV show conceptual nearness. Something is concretely near to a TV show if it brings up and elaborates on the concrete things, settings or people within the TV show. So if a person is depicted in a TV show as "John the houseboater" on his houseboat, then content that is concretely near would involve John and his houseboat. In contrast, content that is conceptually near would not have to treat of John the houseboater or his houseboat. Conceptually near content could simply treat of houseboating in the abstract or other houseboaters and/or houseboats. The subjects in the show were generally in favor of content that manifested concrete nearness and they only advocated bringing in content manifesting conceptual nearness if it was particularly valuable (i.e., contact information, and pointers to further information). One way to summarize this is to say that in absorbing the content of the ITV service, the subjects were more willing to make concrete associations to the particulars of TV shows rather than engage in abstract or conceptual associations.

Concrete and conceptual nearness will let the viewer accommodate more easily to the ITV service since little is demanded mentally to do so. The viewer accommodates mentally to the TV-show, the ITV-interface and the ITV-content in unison. In figure 2, optimal accommodation is predicted to occur in the first quadrant, we may call it the accommodational quadrant. It is only in this quadrant that the ITV service elements are both concretely and conceptually near. We realize that no final conclusions can be drawn from this study regarding the importance of concrete and conceptual nearness. We hope, however, to in some small way suggest how usability can be thought of as being dependent on factors that have to do with the

content presented with an information tool rather than the tool itself. Why the subjects reacted the way they did regarding the content of the ITV service need to be investigated in future studies.

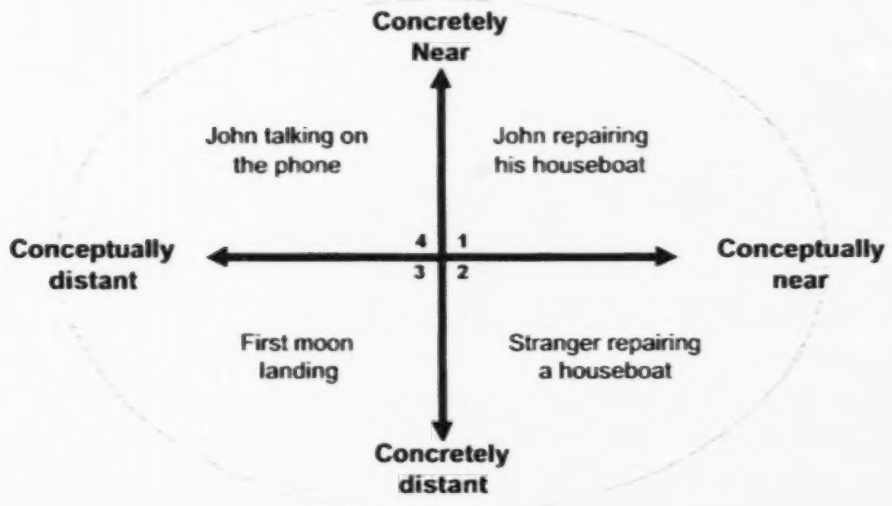

Figure 2: Concrete and conceptual nearness for a TV show about John the houseboater.

Conclusions

We suggest a way to make ITV services more attractive. The traditional approach has often been to include various appealing graphics (Westerlink 1998). Our suggestion, however, is that careful attention not only be given to the appearance and metaphorical meaning of included graphics, but that included graphics be evaluated in terms of concrete and conceptual nearness. When using place-like interfaces for DTV, the buttons on DTE remotes should be mapped carefully to avoid cognitive dissonance between, e.g., user beliefs about navigation and item selection. However, DTE remotes have limited sets of universally usable buttons (across hardware) and designers may be tempted or even forced to design cognitively dissonant use schemas. Furthermore, it is unsafe to rely on basic multimedia interface techniques in DTV interfaces as many users seem to have considerably difficulty with them. In the final analysis, we acknowledge the difficulty of designing novel media rich interfaces, and the need to establish good usability as fundamental.

If our conclusions are correct with respect to concrete nearness, which further investigations would have to decide, then the implications for ITV educational television are important to consider. We have not treated of learning in the traditional sense, e.g., in terms of retention and recollection, much because of our limited knowledge of the subject. The results presented here point to a way of making a more positive impact on the learners' attitude to ITV information services for distance education. By treating the content of an ITV information service as being subject to blending, through concrete nearness, with the TV show, the ITV information service can be received as more interesting, enjoyable and meaningful. In sum, we have arrived at a suggestion for a tripartite agenda in developing and ITV information service: (1) to put usability first and make early usability studies, (2) choose content which is concretely near to the TV show at hand and, if time and the budget at hand permits it, (3) experiment with novel interfaces for even more engaging learning experiences.

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